Claims

1. A polymer electrolyte where a proton conductive polymer (A) and a polymer (B) which is different from (A) are mixed, characterized in that the ratio of the amount of unfreezable water, represented by formula (S1), in said polymer electrolyte is no less than 40 wt% and no greater than 100 wt%.

(ratio of amount of unfreezable water) = (amount of unfreezable water) / (amount of low melting point water + amount of unfreezable water) × 100 (%) … (S1)

2. The polymer electrolyte according to Claim 1, characterized in that the ratio of the amount of unfreezable water in the polymer electrolyte to the weight of the polymer electrolyte when dried, which is represented by formula (S2), is no less than 20% and no higher than 200%.

(content of unfreezable water) = (amount of unfreezable water in polymer electrode) / (weight of polymer electrolyte when dried) × 100 (%) … (S2)

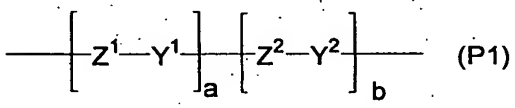
3. The polymer electrolyte according to Claim 1 or 2, characterized in that the proton conductive polymer (A) is a non-perfluorinated proton conductive polymer.

4. The polymer electrolyte according to Claim 3, characterized in that said non-perfluorinated proton conductive polymer has at least one type of an anionic group selected from among a sulfonic acid group, a sulfone imide group, a sulfuric acid group, a phosphonic acid group, a phosphoric acid group and a carboxylic acid group.

5. The polymer electrolyte according to Claim 3 or 4, characterized in that said non-perfluorinated proton conductive polymer is a proton conductive polymer having a polar group in α main chain.

6. The polymer electrolyte according to Claim 5, characterized in that the polar group is made of at least one or more types selected from among a sulfonyl group, an oxy group, a thio group, a carbonyl group, a phosphine oxide group, a phosphonate group, an ester group, an amide group, an imide group and a phosphagen group in said proton conductive polymer.

7. The polymer electrolyte according to Claim 5 or 6, characterized in that said proton conductive polymer is made of at least one or more types of selected from among aromatic based polymers having repeating units that can be represented by the following formula (P1).



(P1)

(Here, Z^1 and Z^2 indicate an organic group that includes an aromatic ring and each of these may indicate two or more types of groups. Y^1 indicates an electron withdrawing group. Y^2 indicates O or S. a and b indicate independent integers from 0 to 2, where a and b are not zero simultaneously.)

8. The polymer electrolyte according to any of Claims 1 to 7, characterized in that said polymer (B) is a cross linking polymer and said proton conductive polymer (A) is substantially uniformly mixed with the cross linking polymer (B).

9. The polymer electrolyte according to Claim 8, characterized in that said cross linking polymer (B) is at least one type selected from a radical polymerizing polymer, an epoxy based polymer, a melamine based polymer, a phenol resin based polymer, a urethane based polymer, a urea based polymer and an inorganic cross linking polymer.

10. The polymer electrolyte according to Claim 9, characterized in that said cross linking polymer (B) is an inorganic cross linking polymer, and the inorganic cross

linking polymer has an anionic group.

11. The polymer electrolyte according to Claim 10, characterized in that the anionic group of said inorganic cross linking polymer is at least one or more types selected from among a sulfonic acid group, a sulfone imide group, a phosphonic acid group, a phosphoric acid group and a carboxyl group.

12. A polymer electrolyte membrane made of the polymer electrolyte according to any of Claims 1 to 11.

13. A membrane electrode assembly, characterized by being made of the polymer electrolyte or the polymer electrolyte membrane according to any of Claims 1 to 12.

14. A polymer electrolyte fuel cell, characterized by being made of the polymer electrolyte or the polymer electrolyte membrane according to any of Claims 1 to 13.

15. The polymer electrolyte fuel cell according to Claim 14, characterized by being a direct type fuel cell using at least one type selected from among alcohol and dimethyl ether of which the carbon number is 1 to 3, and mixtures of these with water as a fuel.